



CO2 trading. A cost-efficient tool to achieve political goals?

case 3: trading in CO2 quotas

Dubgaard, Alex

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Case 3 ■ Trading in CO₂ quotas

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ALEX DUBGAARD

Let there be no doubt: Trading in CO₂ reduction commitments does not in itself solve the greenhouse effect problems. The anthropogenic greenhouse effect can only be limited through physical changes in the form of reduced fossil fuel consumption, biological carbon sequestration and other measures that limit greenhouse gas build-up in the atmosphere. In other words, you cannot globally buy your way out of the problems. The purpose of CO₂ trading is to realise the politically agreed reductions as cost-effectively as possible for society/the world in general. The overall objective is thus politically determined, while the market is used to allocate the agreed reduction between countries, producers and consumers. Not until then does it make sense to talk about ‘buying your way out of the problems.’ By trading in CO₂ reduction commitments, individual countries and individual emitters can pay someone else to take over (some of) their commitments, in much the same way as the normal division of labour between countries and producers in connection with the production of goods and services. The reasoning is also the same: Through a division of labour between countries and producers, considerable cost savings may be achieved – and thus potentially more welfare gained for all.

Cost-effectiveness

Thus, the purpose of CO₂ trading is rather limited. It is not about giving priority to controlling the greenhouse effect over other national or global problems. This prioritisation takes place politically through the acceptance of reduction commitments before CO₂ trading is implemented. Nor is it about how we get the best pollution control for a given sum of money. The justification for CO₂ trading is not that there is a specific sum of money available for controlling the greenhouse effect. As mentioned above, it is a political decision how much greenhouse gas emissions should be reduced – not how much it should cost. The economic rationale for CO₂ trading is to realise the politically determined reduction target as cost-effectively as possible for society. It is thus a question of employing cost-effective economic *regulation* instruments to realise an already adopted political objective.

Kyoto Protocol

Box 1

Under the Kyoto Protocol, which was adopted in 1997, a number of industrialised countries and transition economies have committed themselves to reducing their greenhouse gas emissions in the 2008-2012 period. Less developed participating countries have undertaken no quantitative reduction commitments. The Kyoto Protocol allows the participating countries to apply three flexible mechanisms to facilitate a cost-effective realisation of the reduction commitments:

1. **Emissions trading (ETS).** The ETS means that industrialised countries reducing their emissions more than their commitment level can sell emission rights to other industrialised countries which want to emit more than permitted. Trade is conducted in terms of *Assigned Amount Units* (AAUs). One AAU represents the tradable right to emit one metric ton of CO₂-equivalent. Quota trading is described in more detail in Box 2.
2. **Clean Development Mechanism (CDM).** The CDM allows the industrialised participating countries to fund projects which reduce the emission of greenhouse gases in other countries – primarily less developed participating countries without reduction commitments. For each project, an independent commission must confirm that the reductions in question are *additional* reductions in relation to a realistic base line. The commission then issues *Certified Emission Rights* (CER) which are credited to the balance for emission reductions in the country funding the project.
3. **Joint Implementation (JI).** JI allows the industrialised participating countries to fund emission-reducing projects in other countries with reduction commitments and subsequently have the reduction credited to their own reduction obligations. If the host country meets a number of specific requirements, it may issue *Emission Reduction Units* (ERU) itself. If not, as is the case with the CDM, the reduction must be confirmed by an independent commission.

A network of national registers keeps track of the holdings of AAUs, CERs and ERUs which all represent one tonne of CO₂ equivalents per unit. These units are called *Kyoto units* and together make up the individual country's Kyoto account.

Under the so-called supplementary principle set out in the Kyoto Protocol, national emission reductions must constitute a significant element of the effort. How much a 'significant element' is in practice has not been specified in detail, but the EU argues that it should be at least 50 per cent of the total reduction commitment. In the Danish allocation plan for 2008-2012, an upper limit of 19 per cent of the quota allocation (32.5 per cent for electricity production) has been set for the use of JI/CDM credits.

Sources: United Nations (1998) and
United Nations Framework Convention on Climate Change

The regulation instruments cannot help define what the overall reduction target should comprise. To this end, economic *analysis* instruments such as cost-benefit and cost-effectiveness analysis may be used. The purpose of a cost-benefit analysis is – in short – to identify the scope of socially optimal pollution reductions, whereas as a cost-effectiveness analysis is used to answer questions such as: How do we get the best environment/pollution control for a given sum of money (Pearce et al., 2006)? Economic analysis instruments will not be described in further detail here, as they are of no relevance in themselves to the issue of the pros and cons of CO₂ trading.

One may ask why it should be cheaper to realise a given reduction target by letting the market determine the allocation of the reduction commitments. Here, it will be useful to first take a closer look at the Kyoto Protocol, which is described in Box 1. Under the Kyoto Protocol, the industrialised countries have committed themselves to individually agreed reductions in their greenhouse gas emissions. The industrialised countries must together reduce their emissions by 5.2 per cent relative to their 1990 levels, whereas no quantitative reduction commitments are imposed on less developed countries. The EU has committed itself to a total reduction of 8 per cent, distributed among the member states in accordance with the EU's Burden-Sharing Agreement from 1998. Denmark and Germany agreed to reduce their emissions by 21 per cent, which, in the case of Germany, however should be seen in the light of the already implemented and expected closure of obsolete heavy industries. By comparison, the Netherlands must reduce its emissions by 6 per cent, France by 0 per cent, whereas Sweden has been granted permission to increase its emissions by 4 per cent. The background for the high emission reduction targets in Denmark and Germany is that both countries have relatively high emissions of greenhouse gases per inhabitant, among other things because a considerable share of their power generation is coal-fired. France and Sweden, on the other hand, have based a large proportion of their power generation on non-CO₂-emitting nuclear power and hydropower.

The differences in reduction costs have to some extent been taken into consideration when establishing the individual countries' reduction commitments under the Kyoto Protocol. However, considerable variations in the *marginal* reduction costs from country to country should be expected. In this context, marginal reduction costs means the reduction costs per tonne of CO₂ equivalents in connection with successive reductions until the overall reduction target has been reached. At the beginning, it will generally be possible to obtain energy savings and technology improvements at low reduction costs, but once the low-hanging fruit has been picked, the marginal reduction costs will increase.

Differences in marginal reduction costs are what provides the rationale for CO₂ trading. If the marginal reduction costs are higher in country A than in country B, it will be advantageous for the two countries to reallocate their reduction commitments, so that country A pays country B for assuming (a part) of country A's reduction commitments. The same applies to companies with different marginal reduction costs. In a competitive CO₂ market, reallocation

through trading transactions will continue until the marginal reduction costs have been equalised between countries and businesses. Equal marginal reduction costs for all polluters is the basic condition in environmental economics for social cost-effectiveness of pollution control (Perman et al., 2003). If this condition is met, no additional savings can be achieved by trading in reduction commitments.

CO₂ trading enables flexible adjustment to the reduction requirements set out in the Kyoto Protocol under the conditions described in Box 1 and Box 2. Countries and companies with high marginal reduction costs will only reduce their emissions by a relatively small proportion and will instead buy CO₂ emis-

The EU quota system for greenhouse gas emissions **Box 2**

The EU has adopted a directive establishing a scheme for greenhouse gas emission allowance trading within the Community. The scheme covers a significant part of the energy sector and the energy-intensive industries. The purpose of the scheme is to contribute to a more cost-effective reduction of the emission of greenhouse gases. Enterprises in the sectors covered by the quota system are allocated rights to emit a certain amount of greenhouse gases in the form of CO₂ emission allowances or quotas. The rights can be purchased and sold in the quota market. Enterprises which believe that they can profit from reducing their greenhouse gas emissions by more than is required according to their quota allocation are allowed to sell their quotas. Similarly, if an enterprise expects that it can profit from emitting more CO₂ than its own emission allowances, it can buy quotas. In other words, enterprises can only exceed their emission allowance by paying other to keep their CO₂ emissions correspondingly below their emission allowances. The total amount of emission allowances thus make up an EU ceiling on the CO₂ emissions in the sectors covered by the scheme.

Under the existing system, at least 90 per cent of the emission allowances are free, whereas the rest are auctioned off. The European Commission has, however, presented a proposal for a climate and energy package for the 2012-20 period in which the allocation of free emission allowances will gradually be replaced by the auctioning-off of quotas. In future, enterprises covered by the emission allowance trading system will have to pay for their entire emission of greenhouse gases. This cost will (to a greater or lesser extent) be transferred to consumers in the form of higher prices of electricity and other energy-intensive products. This will give consumers even stronger economic incentives to save energy and to reduce their consumption of energy-intensive products.

Source: The European Parliament and the Council of the European Union (2003).

sion quotas. These quotas will be offered by countries and companies with relatively low marginal reduction costs, which, in turn, will have to reduce their physical emissions correspondingly. As neither party may emit more than their respective quota, the overall reduction target will be realised as a result of this arrangement – and, what is more, at lower costs than without a reallocation of reduction commitments. The fact that the level of reduction varies geographically is irrelevant to the climate. The greenhouse effect of one CO₂ equivalent is the same regardless of where it is emitted.

Objections to CO₂ trading

The economic justification for CO₂ trading is based on the ethical position that minimising the costs of achieving a social (e.g. environmental) objective is a good thing, all other things being equal. Cost minimisation means that there will be more resources (in the form of labour, capital etc.) available for other social purposes, such as the production of goods and services, additional environmental improvements or other things desired by society. Based on this assumption, CO₂ trading contributes to increasing social welfare. It is based on this assumption that most economists recommend CO₂ trading. The incorporation of the various flexible mechanisms in the Kyoto Protocol demonstrates that there is also political backing for this view.

But there are (of course) different opinions on CO₂ trading. Some of the objections are economic by nature as they do not reject the ethical assumptions behind CO₂ trading but question whether the assumptions regarding cost-effectiveness/economic welfare gain will in fact be realised. It's a frequent argument against CO₂ trading that the money would be better spent on reducing greenhouse gas emissions at home rather than spending it abroad to buy CO₂ quotas. Another objection made is that CO₂ trading will enable Eastern European countries to sell emission allowances which they do not utilise today, thus eroding the reduction target set out in the Kyoto Protocol. Finally, some of the flexible mechanisms are criticised, as it is claimed that it is difficult to control whether there are real reductions behind the transactions. Some critics also dismiss, however, that cost savings can be seen as an ethically acceptable reason for allowing CO₂ trading. The underlying ethical position is typically that we, as a society, have an obligation to take care of the pollution problems we create ourselves – and not pay our way out of it. We will start by taking a closer look at the economic points of criticism.

Is it (always) best to spend the money domestically?

As mentioned above, one of the arguments often put forward is that it must be best for society if the money is spent on greenhouse gas reductions at home instead of paying other countries to do so. This claim is typically based on two arguments: 1) If investments are made in domestic reduction measures, it will generate economic activity and employment in the country and thus

more welfare; 2) Supporting alternative energy and energy savings domestically will promote technological development and create first-mover benefits.

Major objections may be raised in both cases. It is, of course, correct that investments in local energy-saving measures will typically have an effect on employment. However, this is only a relevant economic argument if the labour (and capital) involved does not have alternative employment opportunities. In a situation characterised by labour shortages, the employment argument is of no relevance to society in general (but could be in fringe areas with permanent employment problems). Even if unemployment goes up, it is doubtful whether energy investments are a suitable instrument for reducing cyclical fluctuations, as climate policy should rest on long-term objectives and measures.

As for the development of new technologies, it is often overlooked that CO₂ trading *per se* will generate incentives for developing new technologies, as CO₂ trading increases the costs of emitting greenhouse gases for producers and consumers. This in turn makes it economically more attractive to develop and implement energy-saving and renewable energy technologies. On the other hand, this does not mean that all technological development should be left to market forces alone. There are still reasons for supporting what is called learning-by-doing industries where a new technology must be applied to generate the improvements that may gradually render it competitive. That may justify subsidies for renewable energy technologies such as solar cells and wave energy. But it is important that these subsidies are phased out when the technology has reached a development stage where it can – or should be able to – compete under market conditions.

‘Hot air’

Due to a major economic decline since the collapse of communism, the greenhouse gas emissions of Russia and the Ukraine have dropped more than their national reduction commitments under the Kyoto Protocol. The two countries have the option of selling their emission allowances in the quota market. Critics claim that trading in these surplus emission rights, also named *hot air*, will undermine the overall efforts to reduce greenhouse gas emissions. The criticism is, however, based on questionable (economic) assumptions. As the economy grows in Russia and the Ukraine, the emission of greenhouse gases will increase. The possibility of selling CO₂ quotas to other countries means that, for society, there is a positive shadow price of increasing greenhouse gas emissions. The shadow price equals the price of CO₂ emission allowances. In other words, CO₂ trading will provide the same economic incentives for limiting greenhouse gas emissions, irrespective of whether a country has an emission allowance surplus or deficit. Without CO₂ trading, the incentives for limiting the emission of greenhouse gases would be considerably smaller in countries with emissions below their emission allowance under the Kyoto Protocol.

Control problems

Control problems in connection with CO₂ trading are associated, in particular, with the *Clean Development Mechanism* and *Joint Implementation* instruments, which are described in detail in Box 1. In both instances, industrialised countries have the option of meeting some of their reduction commitments by funding projects which reduce greenhouse gas emissions in other (less developed) countries. An example of this is Denmark's funding, under the *Clean Development*

One of the most debated issues in connection with the Kyoto Protocol is the US aversion to mandatory greenhouse gas emission targets. Here, the environmental organisation Greenpeace offers its views on the possible outcome of non-US participation.



Mechanism, of a power plant in Malaysia fired with biomass instead of diesel oil. Under the *Joint Implementation* scheme, Denmark is, among other projects, funding a geothermal project in Romania to replace lignite-based energy production. It may, of course, be difficult to decide whether the reductions in greenhouse gases would not have occurred anyway, i.e. to which extent the reductions are additional reductions. Still, the parties are not free to decide themselves how large a reduction a project will give. As explained in Box 1, independent bodies must approve the *Certified Emission Rights* and *Emission Reduction Units* issued under the two schemes. Finally, the supplementarity principle limits the extent to which CO₂ trading can be used to meet the individual countries' mitigation obligations – such as described in more detail in Box 1.

Ethical aspects

In the absence of CO₂ trading, each country will have to reduce its own greenhouse gas emissions to the extent specified by the Kyoto Protocol. It is probably a widely held opinion that this is the most reasonable approach – even though it may not be the least-cost solution for the participating countries. Most economists find it difficult to see the point of rejecting taxes on pollution or trading in pollution permits if it does not affect anyone negatively but only means that pollution control takes place at lower costs. In a climate context, it is irrelevant which countries reduce the emission of green house gases. The emission of greenhouse gases is a so-called uniform global pollution which has the same effect on the climate irrespective of where the emissions occur. Therefore, it does not matter which countries are reducing their emissions as long as total global emissions are reduced sufficiently.

Optimal or cost-effective use of society's scarce resources play a central role in economic theory. The economic paradigm is based on *consequentialist ethics* where the 'good' which society should seek to achieve is the satisfaction of the desires and needs of its citizens to the highest extent possible (Hausman & McPherson, 1996). The needs of citizens are assumed to include goods and services in a wider sense, including the services delivered by the environment. Cost minimisation in connection with pollution control makes it possible to generate more of what citizens want. CO₂ trading contributes to cutting the costs of controlling the greenhouse effect globally. It is therefore regarded as an economic control instrument which can promote the 'good'.

Final observations – the market vs command and control

The market is not the only resource allocation instrument available to society. Resource allocation may also take place through command and control where polluters are given more or less detailed instructions as to what they should produce and how – or how much and by means of what technology they should reduce their pollution. But achieving cost-effectiveness in centrally controlled production activities requires huge amounts of information about production opportunities and technology. Historical experiences with centrally planned

economies have been conspicuously poor, and the political discussion about centrally planned economies vs market economies has practically ceased when it comes to the production of ordinary consumer and capital goods. Gradually, the notion of the advantages of the market has also had an impact on our views on how to organise pollution control. This has led to an increase in the use of incentive-based environmental control instruments – primarily in the form of green taxes and transferable pollution permits. It is important to note that the use of economic instruments does not imply that the definition of environmental objectives is left to the market. The extent to which pollution should be reduced is decided politically. It is then left to the market mechanism to allocate the reduction commitments among the polluters and, in connection with the Kyoto Protocol, also among the participating countries.

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Case 3 ■ Trading in CO₂ quotas

CO₂ trading. Should you be able to buy your way out of the problems?

PEDER AGGER

In a market-dominated society, it is obvious to think that the problems with greenhouse gases are best solved by leaving them to the 'market'. It is thus a question of, one way or the other, converting the relevant parts of the problems into commodities for which a price can be fixed and which can then be sold in the usual manner. Supply and demand will subsequently see to it that the costs are minimised and that the level and localisation of the production and consumption will be based on an overall consideration of what is most appropriate. As we live in a market-dominated society, I also believe that it is only natural that the market should contribute to at least some of the necessary regulation. But it is still a far cry from 'buying your way out of the problems'. Below, I will try to explain why.

I will restrict myself to focusing on one type of commodity: the CO₂ quotas, i.e. the right to emit specific quantities of carbon dioxide or quantities of other gases having a similar effect that the countries which have ratified the Kyoto Protocol are allowed to emit and thus also sell in the market. If the total quantity of emissions allowed is set just below what is required, a demand for permits, and thus a market for these, is created.

If a country wants to emit more CO₂ than the quota allocated, it can either buy surplus quotas from another party or a documented reduction of a similar size must occur elsewhere, either as a result of reduced emissions or by binding extra CO₂. The quota trading will typically take place between more or less developed industrialised countries, or when an industrialised country pays a developing country for increasing the use of renewable energy, increasing energy efficiency or by binding CO₂ through flue gas purification, or in forests, in the soil or underground. The market is regulated by the so-called *Clean Development Mechanism* (CDM). The arrangement may be in the form of so-called *Joint Implementation* where one country meets its reduction target by investing in a project in another country which can then achieve its reductions with less costs. This solution model is, however, characterised by significant drawbacks.



The critical perspective: The Indian environmental activist Vandana Shiva has said the following about the Kyoto Protocol: «... Kyoto introduced a system of emissions trading which in effect rewards the polluters by assigning them rights to degrade the atmosphere and allowing trading in these rights ... Today, the emissions trading market totals USD 30 billion and is expected to reach USD 1 trillion. Meanwhile carbon dioxide emissions continue to increase, as do emissions from polluting industrial activities» (Information 2008).

Firstly, it is a drawback that even an ideally friction-free market will only be able to distribute the agreed total quantity of quotas in accordance with the laws of the market. The market cannot reduce the total quantity of quotas to the level where it should be. This can only be fixed politically, which is attempted on the international political scene when discussions are held to decide which nations should reduce their emissions to a given percentage of their 1990 level and by when. In addition, the quotas allocated were initially so generous (and free of charge) that it will take years before the quota system will have any serious impact on total emissions.

Another drawback is when a country's CO₂ reductions are only achieved by buying quotas abroad, which means that, as long as this situation applies, there will be no immediate incentive to develop technological or organisational solutions in the country in question to reduce local CO₂ emissions. Quota trading may thus further delay the necessary long-term changes of infrastructure and building layout which should preferably start today and not tomorrow. What

is at stake is, in other words, not only the economy but also the consequences for technological development and the acquisition of knowledge.

Thirdly, there are also political problems: For ethical reasons, many citizens do not want us to shirk our responsibilities by trying to buy our way out of the problems in this way. It may even resemble an attempt at absolution – a sale of indulgences that relieves us from doing anything ourselves. We distance ourselves from the problem. We can lean back, make a few adjustments to our development aid and otherwise carry on as before. If no changes take place at home, the entire effort will be seen as ‘hot air’. This is where ethics comes into the picture. Economic rationality is not enough.

To make an impact – or to be accepted, at least – the policy must come from below: From the citizens, or rather from the citizens of the world who realise the necessity of this and who show solidarity with current and future generations. This realisation and solidarity will come and grow much more easily if the responsibility can also manifest itself in everyday life and through personal actions instead of through abstract appeals and complicated explanations. It is difficult for climate consciousness to manifest itself because greenhouse gases are invisible, there is a long way in terms of both time and space between cause and effect, and it may be difficult to see if our own minor contribution makes any difference at all.

Finally, there is the question of verifying whether words equate to action in this market: What was the emission level before? How much CO₂ is actually bound? Can we be sure that it does not just result in increased emissions elsewhere or later? The problems of establishing reliable control systems are manifold.

In addition to the problems mentioned, i.e. establishing the total quantity of CO₂, ensuring the technological development and build-up of knowledge, as well as the conscience and control aspects, there is the overall problem: That the emissions of greenhouse gases and the resulting change is not a simple, isolated problem which is easy to rank along with other, equally complex problems such as decreasing biodiversity, food shortages, poverty and health problems. The CO₂ problem is, so to speak, just another element in the complex of problems resulting from society’s techno structure and our way of life as it has developed historically and geographically and which is difficult to think of as a commodity.

“We have to prioritise,” is, however, the message from Bjørn Lomborg’s *Copenhagen Consensus Conference* which believes that fighting AIDS and ensuring clean drinking water should be given higher priority than controlling climate change, because “we cannot afford everything.” As if we have not been prioritising so far. It is actually the only thing politics is about. And as if we have a choice, e.g. as if we can afford to do nothing about AIDS, drinking water or the climate. But if we cannot afford to do what is required, we still have to find the funds because there is no alternative. The necessary path has got a name. It is called sustainable development.

Sustainable development is a form of development that meets the needs of the present without compromising the possibility of future generations to meet their own (United Nations, 1988). Since it first appeared, this concept has been incorporated as an objective in many contexts (amongst others in the Amsterdam Treaty), but has also been the subject of so many interpretations that the concept has been accused of being void and ripe for condemnation. It has, however, proved so persistent that it has created a framework for a discussion that differs from what we have been used to, because the concept contains a number of ethical requirements which, maybe not individually, but together contain important new elements. Today's society must:

- Take into account the needs of future generations
- Ensure a fair distribution of resources among the world's populations
- Respect the limits imposed by the natural world
- Contribute to bringing about a revitalisation of the economy: 'Producing more with less.'

By linking environmental protection and development and by insisting on globality and the long-term perspective and equality, sustainable development is a normative concept, which may be growth-oriented, but only within the framework dictated by the planet and the natural world. You can say that sustainable development is a way of organising complex political discussions where natural scientific rationality and normative arguments may contribute to a more coherent understanding. Relying on the market to ensure sustainable development would, as we will see, be even more far-fetched than thinking that it can solve the CO₂ problems. The normative part of the sustainability concept is simply out of reach of the economy.

Where ethics is about values, politics is about how the value are distributed between the individual and the community, between existing and future generations, between humans and the natural world. Some of these values can be expressed in money terms. This means that the economy and the market still come into the picture as elements which, within certain political and temporal limits, may contribute to an appropriate distribution.

In addition to distributing commodities such as CO₂ quotas, the market may also distribute the cash flows so that they move in the most profitable direction. This makes it possible to subject activities and projects to cost-benefit analyses (CBA) where the total costs and profits may be compared. Here, it is assumed that the different commodities or services can be substituted with others. In this way, the loss of rainforest in Brazil, for example, may be worthwhile and indicate growth if the forest felled provides space for more profitable farming. For some of nature's vital functions, there is, however, a critical limit for how much can be substituted. Many biologists and economists, for example, see eye to eye on this. But there is major disagreement as to what functions and how much is involved. Put simply, the economists believe, and with some justification, that it is up to natural science to say what is so important that it should be left out of the 'substitution accounts'. But natural science is very

reluctant to do so, among other things referring to the considerable uncertainty and lack of knowledge associated with this (Howarth, 2003).

CBA is an analysis tool which can help identify economically sound solutions and is, as such, neutral. Its application does, however, have some limitations which may serve to illustrate some of the innate weaknesses of the environmental economy and thus also provide arguments for why CO₂ trading is hardly able to solve all problems. The shortfalls may be summarised thus:

1. Lack of data and knowledge
2. Unclear or inadequate welfare goal
3. Methodological problems
4. Lack of long-term perspective

Re 1) When embarking on a calculation of economic sustainability, the lack of data is often significant. For example, when the Danish Economic Councils in 1998 set out to calculate whether Denmark was experiencing sustainable development, they had to confine their investigation to only looking at changes in the natural capital within the extraction of oil and natural gas, emissions of greenhouse gases and certain air pollutants, i.e. they restricted themselves to only looking at some of the most centralised and thoroughly controlled and, thus, well-documented elements of Danish production and emission. In addition, no data exist on some very important areas, i.e. not only data but an actual understanding of how things work.

Re 2) Cost-benefit analyses (CBA) are based on a welfare-economic theory which believes that it can provide the most effective prioritisation of the benefits of society based on the normative perception that the goal is the fulfilment of the population's preferences. CBA cannot, however, decide which preferences are 'good' because one benefit may substitute the other. When the same formula is applied to all values, the political debate on value-relational issues, which is otherwise the essence of politics, is, so to speak, closed down. It is a problem, because in a liberal democracy each person is not only a consumer but also a citizen, and we want *both* to satisfy our own preferences *and* to discuss goals and visions on how society should be organised, ideas which make sense in our lives and which define our identity. CBA does not have any visions and is unable to set an upper limit for the total production. The economist Herman Daly has described it as follows: If you see economics as a ship that is being loaded, the market mechanism is likely to help place the cargo so that the ship does not capsize. But it cannot prevent the loading from continuing until the water is above the railings and the ship sinks.

Re 3) CBA requires perfect competition in all markets, which means that a market price exists for all commodities, or that it, at least, can be estimated with some degree of certainty. Willingness-to-pay analyses will get you some of the way. Some of the criticism voiced against the economists' work in this field may be based on a criticism of the gross domestic product (GDP) as an expression of welfare. GDP is, for example, not capable of including income distribution, unpaid labour, the black economy, health, education, freedom,

security, peace, pollution, depletion of resources, cancer and crime. The economic sustainability concept is, to some extent, able to take into account many of these elements. An example of the problems which willingness-to-pay analyses are facing is that some population groups do not answer questions about the value of nature based on a CBA-based prioritisation, but carry out a value-rational weighing instead, perhaps because they confer rights on nature that we must respect. The balance between these different sets of values exists in the political process – not in the market. It is simply not possible to fix a price for several of the amenities that we want to pass on to future generations. The things in question are phenomena such as burial mounds and natural forests as well as the intangible value related to these, e.g. memories, sense of identity and aesthetic experiences.

Re 4) Climate change and biodiversity are processes that evolve over decades and centuries whereas the perspective of markets and economies is usually weeks, months and years. This timescale discrepancy is yet another source of limitation of CBA. Who dares, for example, predict the price of oil 50 years from now? This we need to know for a CBA to be taken seriously in the long term. Future expectations can be expressed in the so-called discount rate, which is the percentage rate of growth that one Danish krone, euro or dollar must be given in the next period to correspond to one Danish krone, euro or dollar today. If a high capitalisation rate is set, the expectations of the annual yield are high, and if a low rate is set, they are low. Calculations of long-term environmental and energy investments are thus extremely sensitive to the capitalisation rate used. In most countries, it is set lower (2-3 per cent) than in Denmark, where the number crunchers at the Ministry of Finance set it high (6-7 per cent). The future does not seem to be of much value to them.

Could one imagine an ethical cost-benefit analysis? An analysis where the good things are weighed against the bad? This requires that all the good and bad thing can be substituted, i.e. included in the same formula. I will not deny that this is possible to some extent. But the nature of such an analysis means that it cannot be left to computers and number crunchers. It must be based on a political dialogue on the many new dilemmas brought about by international developments and which, ultimately, is about how we want to live on this planet.

As part of a sustainable development, climate change must be something we both try to counter and adapt to. But CO₂ trading neither can nor should be the main way to solve the climate problem. For market-dependent short-sighted business interests, a market solution is attractive. But for the long-term interests of the community, it can only be a temporary and limited means in a long-term strategy based on scientifically acknowledged conditions of existence and on all values, also those which the economy cannot grasp but which are crucial for the individual and for the political process.

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Case 3 ■ Trading in CO₂ quotas

Study questions

- 1 What are the main arguments for and against CO₂ trading according to the two authors?
- 2 Do they mainly disagree on scientific or value-based issues?
- 3 In which way do the two authors' descriptions of the Kyoto Protocol mechanisms differ?
- 4 Which role may cost-benefit analysis play in connection with CO₂ trading according to the two authors – and what are their arguments?
- 5 Which consequences will CO₂ trading have for the development of technologies according to the two authors?
- 7 What ethical questions does CO₂ trading raise according to the two authors?